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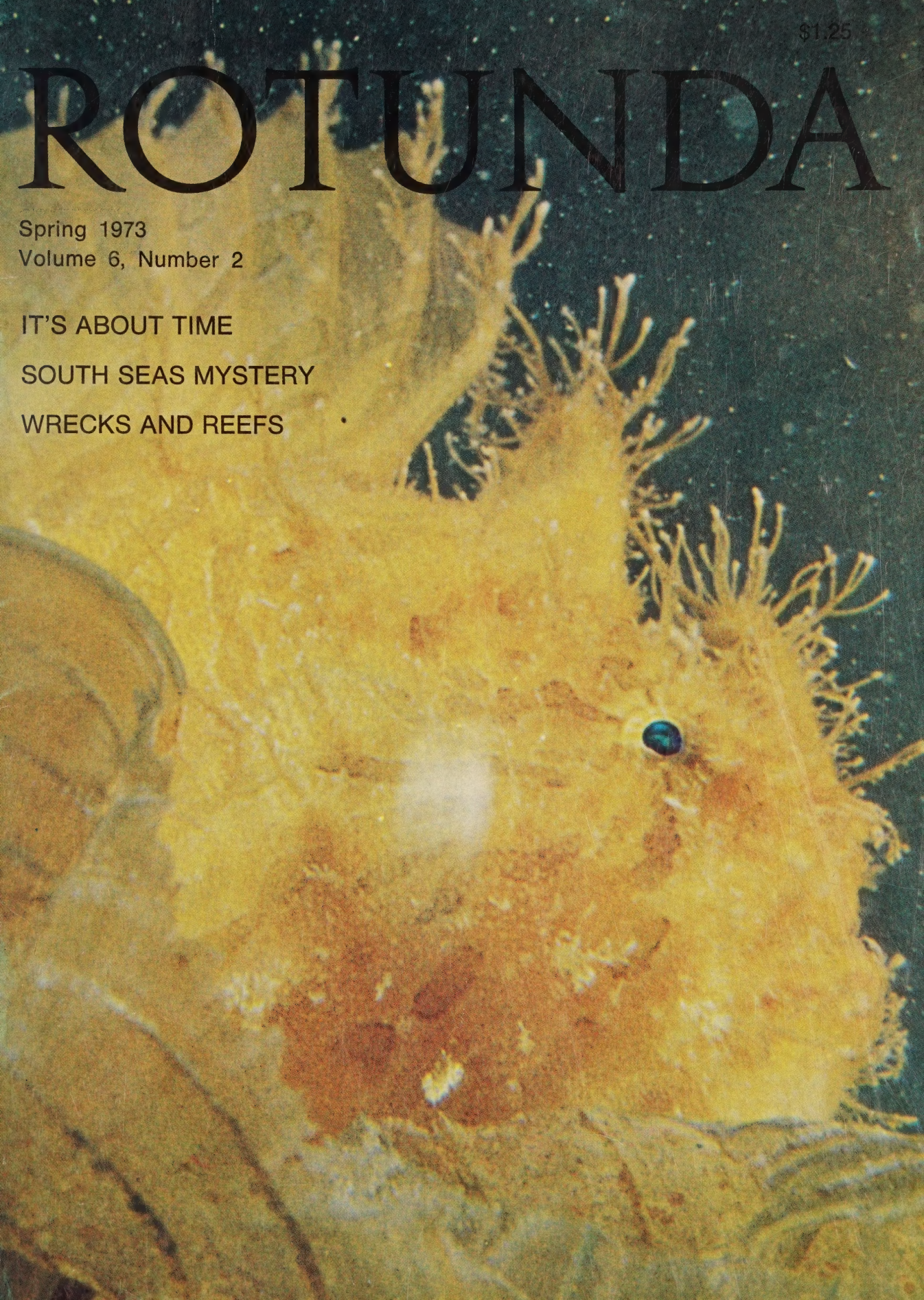
ROTUNDA

Spring 1973
Volume 6, Number 2

IT'S ABOUT TIME

SOUTH SEAS MYSTERY

WRECKS AND REEFS



The Royal Ontario Museum

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ROTUNDA

the bulletin of The Royal Ontario Museum
Volume 6, Number 2, Spring 1973

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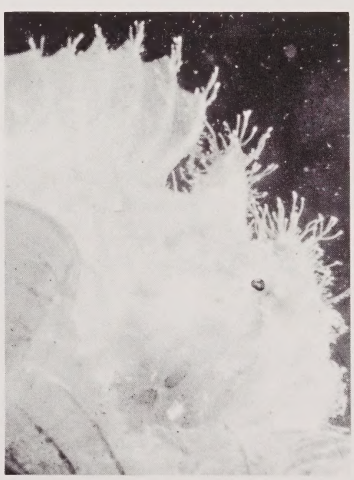


The cover: Brilliant sargassum fish, Histrio histrio, *Barbados*
(see page 34)

Spotlight with the Editor

Past, present and future at the ROM

NEW MAMMALOGY EXHIBITS

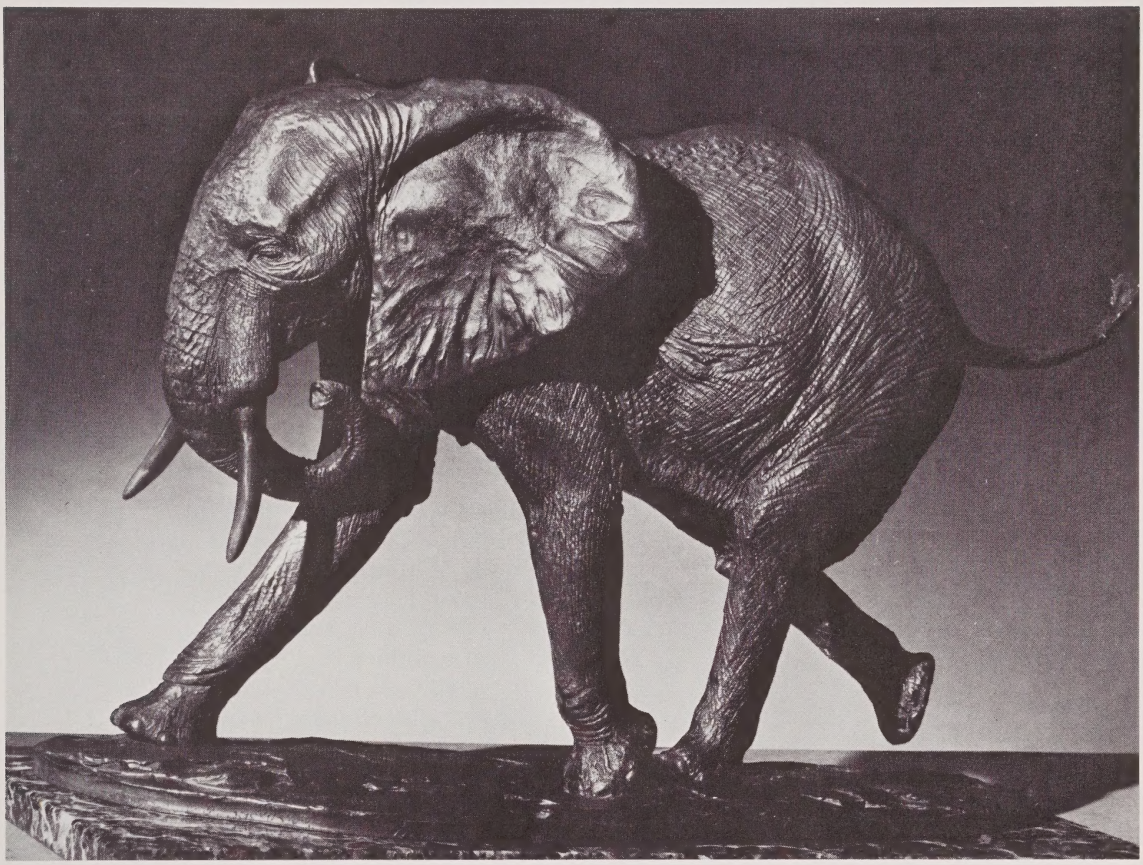
After May 29 two new exhibits will be seen in ROM's third-floor Mammalogy galleries. One is a permanent display.

First, there is a collection of magnificent bronze sculptures of mammals, primarily African. The artist is Robert Glen of Nairobi, Kenya, who has been a member of ROM expeditions to Madagascar and Cameroun and is a noted naturalist. The bronzes, 1/2 to 1/5 natural size, capture both the grace and force of the living animal's motion yet retain scientific accuracy in all details.

The second exhibit will be a permanent part of the galleries. This is the newly completed diorama of an African rainforest. Remarkably exact in its detail—even raindrops have been put on the leaves singly by hand—the diorama is the product of many months' loving labour by the Display Biology Department under its chief, Terry Shortt. The perspective is cunningly devised to give the illusion of being at the eighty-foot level.

Indian Wigwam in Lower Canada; lithograph after the painting by Krieghoff.

Charging Bull. African elephant, bronze by Robert Glen.



KRIEGHOFF PRINTS

Cornelius Krieghoff, perhaps the best known painter in Canadian history, died in 1872. In his lifetime he recorded the life of Quebec in the mid-19th century with a deep feeling for its human qualities.

In celebration of the centenary, Montreal's McCord Museum assembled a superb exhibition of Krieghoff prints. These had been produced in Munich, London and New York by master lithographers during the years 1848-62.

After showing in Montreal, the exhibition travels to Toronto and will open in ROM's Sigmund Samuel Canadiana Gallery on May 9 and be on until August 20. Side by side with the prints will be many of the paintings on which they appear to be based.

MEMBER 5,000TH

Membership of the Royal Ontario Museum recently reached a new plateau when Mrs. Ruth Gill of Toronto became the 5,000th member.

The event was marked at a coffee party and tour for new members. Mrs. Gill was presented with a copy of ROM's latest book, *Chinese Art.* The choice proved appropriate. Mrs. Gill's daughter has just returned from Hong Kong where she has been studying Chinese painting.

DIAMONDS TODAY

It soon will be the traditional time of year for weddings. It's appropriate then that a display of new designs of diamond jewellery opens in the Mineralogy Gallery on May 15.

The collection is made up of the winning pieces from the De Beers Consolidated Mines, Diamonds Today competition. The jewellery on display is all Canadian designed and crafted in the latest forms and styles. It includes diamond engagement rings and wedding bands, cocktail rings and other jewellery for women and men.

THE MOON POOL/NAN-MATAL REVISITED

Alan R. Emery

Abraham Merritt was born in 1884, and became famous immediately following the publication in 1918 of a science fiction novelette entitled "The Moon Pool." The story was set on the island of Ponape in the Caroline Islands of Micronesia (an area now known as the Trust Territories of the Pacific Islands). The hero of the story, Professor Throckmartin, was to study the extraordinary group of island ruins called Nan-Matal. Nan-Matal, according to Merritt (and even today little better known), represented a "colossal riddle of humanity whose answer has to rest in antiquity; a weird flower of man-made civilization that blossomed ages before the seeds of Egypt were sown; of whose arts we know little, and of whose science and secret knowledge of nature nothing."

Sixty-two years after these words had been published I was in the air above Ponape staring down at one of the most unusual islands in all of Micronesia, the second largest, with the most rainfall and jungle. It is not an atoll but a volcanic island with a barrier reef around it. Unlike the coral, sand and palm-laden spits of land surrounding jade-green lagoons and enclosed by azure-blue seas, Ponape sulked in a leaden pool of water, a grey mist hanging heavily over her lush green jungles. Scattered, enormous hulks of shattered basalt thrust through the green carpet below me, mute testimony to the volcanic forces that had formed the island. Professor Throckmartin

View of fortress on approach from inter-island channel.

(opposite) I could not persuade our Ponapean guide to join me in "jail" but this is the view from inside.

Photographs by the author.

The corners of the fortress sweep gracefully upward as much as thirty feet on one corner.

A detailed view of one corner of the fortress showing the construction of the wall using pentagonal shaped logs of stone. Now covered with primitive lichens, these "logs" were hand carved by ancient man.

Enormous and jagged blocks of basalt thrust up through a verdant jungle, proclaiming the volcanic history of the island.

had come by boat; I came by 727 jet and landed in an airport still under construction on a patch of coral reclaimed from the sea by dredging and filling.

My work on the island involved working underwater studying coral-reef fishes. Each island people seems to have a different attitude to the sea. In Palau, for instance, Micronesian men are accomplished divers and work at night spearing large fish sleeping in caves on the reef front, competing with sharks and marine crocodiles of fearsome size and disposition. Ponapeans, however, are fishermen of a more traditional sort using traps and lines, spearing only occasionally in the daytime. My prowess underwater gave me entrance to many discussions I would not otherwise have had. It was they who decided I had to visit Nan-Matal.

The next morning we put our gear into a Zodiac rubber boat to travel to the ruins at Nan-Matal. (The spelling of this word varies greatly because it is a phonetic transcription from a scriptless language.) Once called the Lost Venice of the Pacific, these ancient ruins are the central focus of a series of structures including basalt-lined canals. Nan-Tanach is the native name for the structure and apparently means "the place of frowning walls." In Merritt's story the native guides grew silent and watched the place fearfully. Our guide was indeed quiet and respectful. To get to Nan-Matal our boat trip involved following the inner lagoons, and our guide led us skilfully at great speed across coral strewn flats that could easily have ripped our frail vessel asunder. A particularly difficult and shallow area protects Nan-Matal from approach by this route. Metalanim Harbour is fairly large, but once across it, an apparently solid wall of coral faces the would-be navigator. Even our guide slowed down to search for the narrow channel that would take us to the ruins. Finally, the scratch in the coral was found. Straight as an arrow, with a single deceptive curve, it brought us quickly to the canal. Merritt could not have actually visited this area because no sizeable vessel could reach Nan-Tanach from Metalanim Harbour. In fact, the fortress is well hidden from the sea. A small pass in the coral reef just south of Metalanim is the only entrance from the sea for vessels of greater draft than a dugout canoe. Of course, Merritt did not have the experience of postwar underwater wreckage, but his assertion that ancient remains could be seen submerged is most unlikely. Active coral growth, so characteristic of the area, and so usual on any clear or new surface, would have obliterated all traces in a few hundred years, to say nothing of some thousands of years.

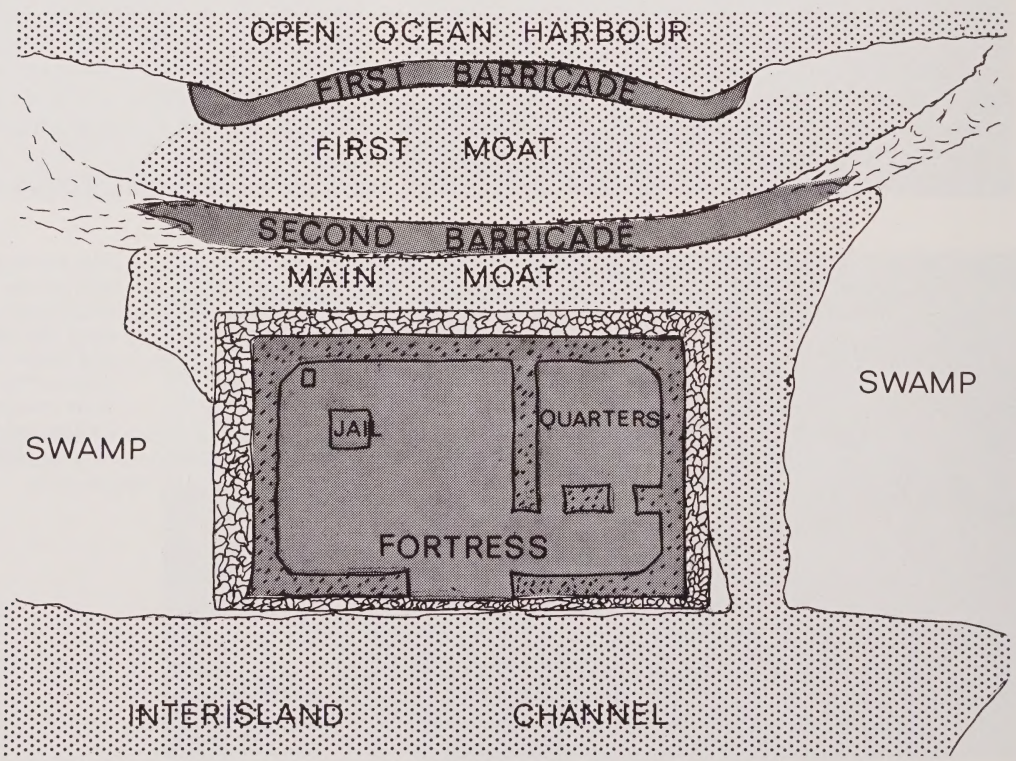
Dark, heavy stones lined the hushed canal as

The massive cornerstone was carried by some ancient sea-going raft from the main island of Ponape and man-carried to be placed in its present position. I estimated its weight at about 100,000 pounds.

we moved slowly along. The sounds of the surf and splash of small waves were gone. My eye was drawn immediately to the structure of the canal. Hand-dredged and lined with now disarrayed basaltic "timbers," it showed how extraordinarily diligent the ancient workmen had been.

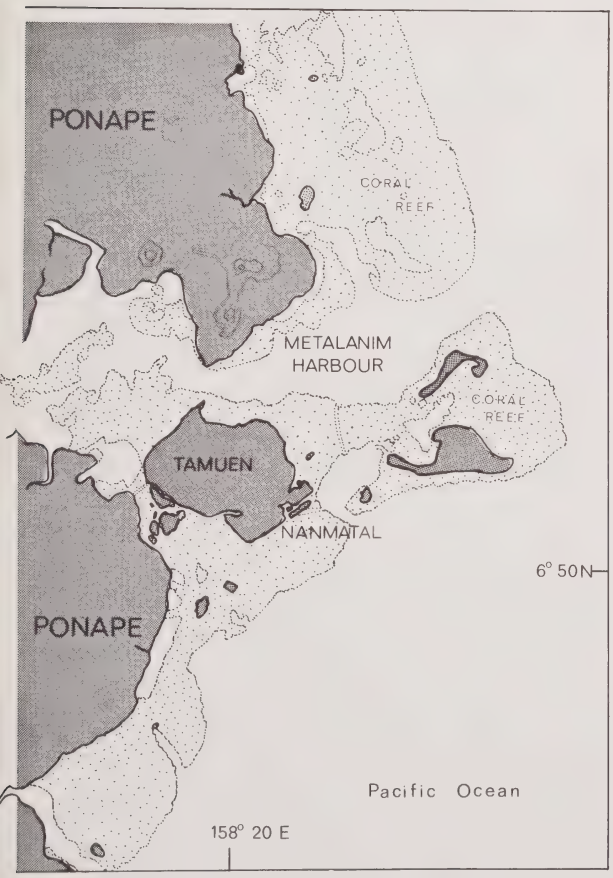
Suddenly, my companion (Dr. John E. Randall, an ichthyologist from the Bishop Museum in Hawaii) shouted: "A half-beak, in the canal, let's try to get him." My thoughts immediately switched to the fish. Making use of our modern collecting tools, we failed miserably. Our guide laughed at our efforts and showed us how to get the specimen. Picking up a switch of a palm leaf and taking careful aim, he whipped the water smartly, once, just in front of the elongate lower jaw of our half-beak. The fish lay stunned, and he scooped it out. Jack and I had, however, set out a small amount of fish poison, and just about now large moray eels came slithering out from the dark caves made by stone-lined walls. All were "gasping for breath" and very annoyed. We slipped into the water quietly trying to collect our specimens and stay out of the way of the morays. Fortunately all went well, and we brought several important species (including an unusual moray) back with us. I couldn't help but wonder, though, if in ancient days these large morays had held a respected position in the minds of the Nan-Tanach dwellers. Once back in the boat, we continued towards the ruins, but only our guide watched the approach. Jack and I were busy

Ponape is a very large island, on the western edge of which lies the tiny island of Nan-Matal. The ancient fortress was protected by a series of moats cut from coral and lined with basaltic timbers. It was in this fortress that the evil "moon pool" was supposed to be located.



with the fish, so busy, in fact, that we set our specimens (and lunch) on the main entrance platforms of Nan-Matal without even really noticing where we were.

But the sombre grey-brown walls seemed to impress their presence on our consciousness, until we both looked quickly around, defensively. Still munching on sandwiches, we got to our feet and ascended the wide staircase that led to an inner courtyard. We had only begun our explorations when our guide called us to the outer periphery. He preferred to show us the outside, then the inside. We walked back to the staircase and followed a path that only just remained along the outer wall to the first corner. The corner flung itself overhead in an arched vault nearly thirty feet high. Rounding the corner we followed a narrow path edging the wall and bordered by a dark shallow moat. As we approached the seaward corner, I could see still another wall which contained us, the courtyard and moat. To get to the sea it was necessary to cross this moat (which our guide assured us had marine crocodiles in it). The only life I could see was the curiously adapted mudskipper (*Periopthalmus*). None of us, however, lingered in the moat as we waded and swam across it. We clambered up a roughly constructed wall of basaltic rock only to be confronted by another moat and an even larger wall. The moat, however, was mostly filled. As we climbed the last basalt wall, the sounds of the sea crashed in on us. The front face of the wall extended into deep water and was very strongly constructed of enormous basaltic boulders. But still it did not face the open sea; no invader would be able to see Nan-Tanach from offshore. Although they were in disarray, I felt that I could discern several areas which must have served as sentry posts.



As we climbed over the inner barricade on our rectangle of foreboding rocks, our guide told us of a great fleet of war canoes which attacked Nan-Matal from "the south." They fought their way up and over the first sea wall. With dreadful loss of life, they threw the defenders back to the inner rectangle. Nan-Matal's hero, we were told, wrenched a spear from the hand of an attacker, killed him with it and then drove it through his own foot pinning himself to the mud of the innermost moat. Here he stood to defend his fortress. He died with the rest of Nan-Matal's inhabitants. The invaders pillaged the fortress and left it in ruins. No life was spared. The very spot where the spear struck the ground was marked by a great rent in a piece of coral rubble.

As I looked up I saw that I was roughly one third of the way along the front wall. Walking back to a corner, I was impressed by the immensity of the cornerstone. Fully eight feet high, it was at least as thick and long. And then, I examined the nature of the building design and construction. The islet we stood upon was of coral origin and the natural rocks were calcite. No naturally occurring basalt was close by. Therefore, it must all have been

quarried elsewhere and brought here. From Ponape itself? But where on Ponape? Several basaltic spires had been obvious on the north side of Metalanim Harbour. Perhaps from them. Even if the quarry had been this close, however, these mammoth boulders would have had to travel the open sea to get to the sea-wall of Nan-Matal. A quick estimate of the weight of the cornerstone (roughly $8' \times 8' \times 8' \times 200$ pounds/cu. ft.) came to over 100,000 pounds. No small dugout canoe carried this stone.

The guide noticed me peering intently at the form of the rocks and said: "Each stone you see here is a single crystal." "Now where did he get that idea?" I thought to myself. And to determine the truth of it, I examined them. All of the stones were in the shape of wooden timbers, much as in the early Canadian log houses. Most had either a crude rectangular, pentagonal or hexagonal cross-section, with the majority being pentagonal. But unlike any crystal of which I had heard, they were immense. Some were as small as 4″ to 6″ across and 2 to 3 feet long, but most were over 12″ thick and many were as much as 18″ to 24″ thick and over 18 to 20 feet long. (Another quick estimate of weight for the largest $(1.5' \times 1.5' \times 20' \times 200)$ came to nearly 10,000 pounds.) Crystals are uniform in symmetry unless very compounded. It seemed that near-symmetry and elongate shape had to be man-made. I carefully examined the surfaces of the "crystals." They bore the ancient marks of a mason's chisel. Looking further I found that when these stone logs broke they sheared on fairly clean planes. These mammoth basaltic timbers had been cleaved from the volcanic mountains of which the island was made—cleaved by the hand of primitive man.

Our Ponapean guide standing in the inter-island channel in front of the main stairway into the fortress.

Why did these ancient people work with such industry, and why did they choose such a difficult medium? Ponape is blessed by a heavy rainfall and a dense jungle in which suitable trees abound for fortress building. Coral is a far easier medium to work into building material. And yet these truly stone-cultured peoples insisted on using volcanic rock.

"Within the courtyard is the second enclosure . . . the heart of Nan-Tanach! There lies the great central vault with which is associated the one name of living being that has come to us out of the mists of the past. The natives say it was the treasure-house of Chan-te-kew, a mighty king who reigned long 'before their fathers'. As Chan is the ancient Ponapean word both for sun and king, the name means 'place of the sun king'." So spoke Professor Throckmartin in Merritt's story. Did I find this central vault? I don't know, but I did find two possibilities

Once inside the interior courtyard, the flagging courage of our guide seemed to recover slightly and he beckoned us to inspect what he called a jail. He showed us an area of the courtyard broken by extensive growth of green foliage in which a small pit was cut into the ground. Roughly five feet deep and approximately twelve feet square at the roof, there would have been room for perhaps three people to sit in comfort, and twice that in discomfort. No amount of coaxing would bring our guide into the jail, however. The roof of this pit was a series of parallel basalt timbers. An entrance was provided by moving one of these timbers to one side exposing a pass cut into one of the walls. I slid inside. Jokingly one of my "friends"

went to move the rock timber across this entrance. But, of course, one man could not hope to budge it.

One of us stumbled over a very square, very dark hole in the ground. This, our guide informed us, was where God lived, and was a place from which the ancient men of Nan-Tanach drew their inspiration and omens. Legends of dark underground labyrinths have always been associated with Nan-Matal; was this an entrance? When one of our party bent to look in, the guide drew away.

We had neither lights nor matches, but I was determined to know. With the words: "Look out, God, here I come!" I carefully lowered myself into the hole. I confess to being relieved when, at shoulder height, my feet rested on a firm footing. Somewhat sheepishly, I found I was reassuring myself that the greatest danger I faced was a hidden snake or venomous invertebrate. Quickly dropping into the hole, I felt all light had been snuffed out. Fully a minute later, the confines became dimly apparent. Of remarkable construction, the walls, ceiling and floor were, of course, made of the basaltic timbers, but these were squared to extreme accuracy, and fitted so closely that a scrap of paper could not be slipped between them. The dimensions were surprisingly small. Roughly four feet high, the low ceiling forced me to shuffle forward. Only about eight feet long, this square tunnel ended in a wall composed of four rock logs each with a series of inscribed marks on them. A few were new. Obviously Japanese, the newer symbols were deeply cut, whereas the older ones were both shallow and less complex, although indistinct. Were they an ancient script? It is unlikely, but possible.

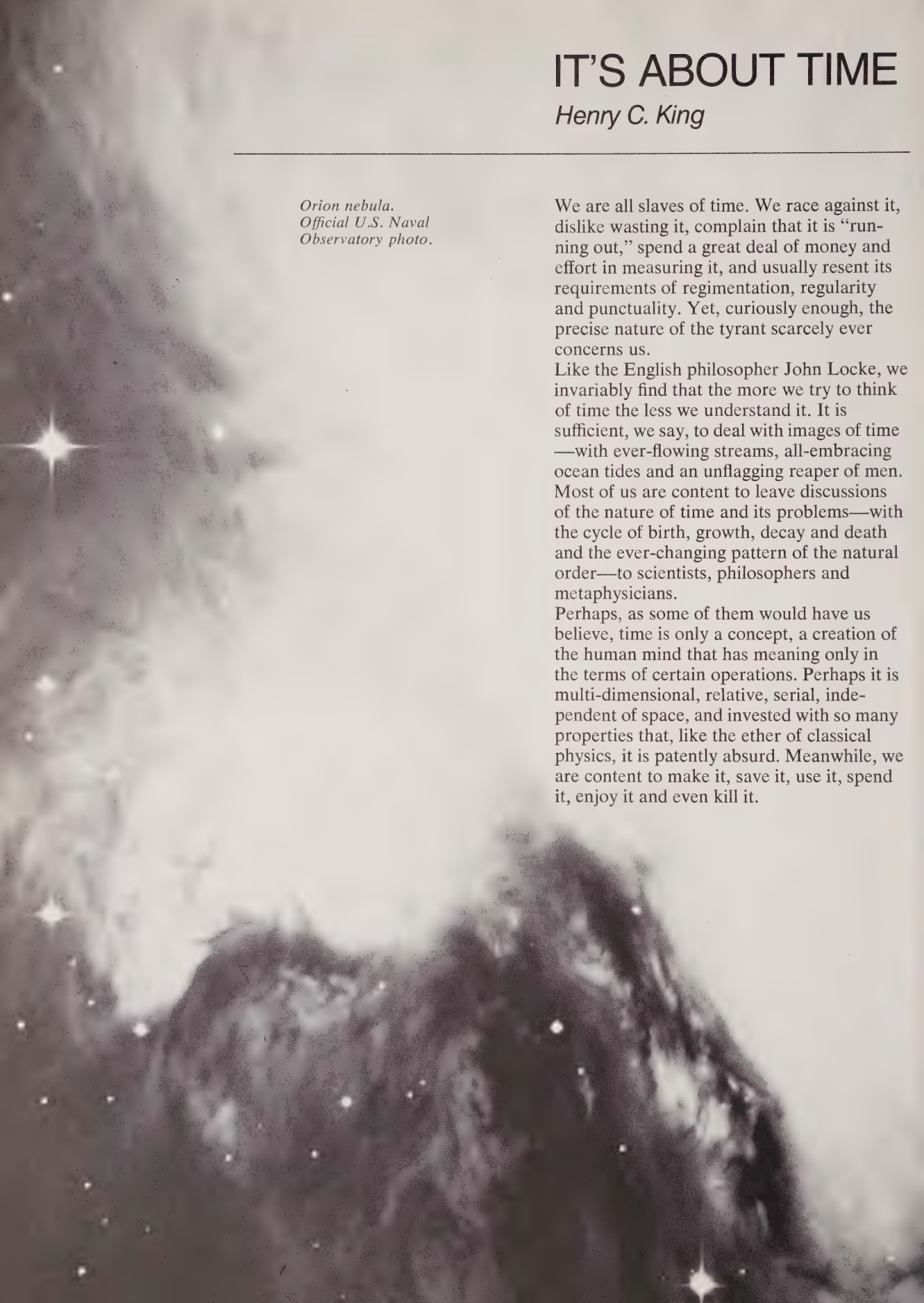
"And opposite this place of the sun king is the moon rock that hides the Moon Pool. . . . There under those walls is the Moon Pool and the seven gleaming lights that raise the Dweller in the Pool, and the altar and the shrine of the Dweller."

But although we explored for a long time, we found only more basaltic timbers forming tunnels and caverns, and no trace of the magic moon rock and its evil hidden pool.

Alan R. Emery's training and interest is in marine biology. After undergraduate work at the University of Toronto, he received his M.Sc. from McGill University in 1964 and his Ph.D. from the Miami Institute of Marine Sciences in 1968. He has worked in the Arctic, Caribbean and Pacific Oceans, most recently with the Ministry of Natural Resources studying game fish and resource management. He has also worked on problems of oil pollution and the environmental effects of electrical generating stations with the Advisory Committee on Energy. Dr Emery's prime interest, however, is in tropical marine biology, with special emphasis on fishes. The article about Nan-Matal arose from an expedition to collect tropical coral reef fishes in the islands of the Pacific Trust Territories, including the Hawaiian, Marshall, Marianas and Caroline Islands. Dr Emery joined the ROM's Department of Ichthyology on January 1, 1973 as Associate Curator.

IT'S ABOUT TIME

Henry C. King



Orion nebula. Official U.S. Naval Observatory photo.

We are all slaves of time. We race against it, dislike wasting it, complain that it is "running out," spend a great deal of money and effort in measuring it, and usually resent its requirements of regimentation, regularity and punctuality. Yet, curiously enough, the precise nature of the tyrant scarcely ever concerns us.

Like the English philosopher John Locke, we invariably find that the more we try to think of time the less we understand it. It is sufficient, we say, to deal with images of time —with ever-flowing streams, all-embracing ocean tides and an unflagging reaper of men. Most of us are content to leave discussions of the nature of time and its problems—with the cycle of birth, growth, decay and death and the ever-changing pattern of the natural order—to scientists, philosophers and metaphysicians.

Perhaps, as some of them would have us believe, time is only a concept, a creation of the human mind that has meaning only in the terms of certain operations. Perhaps it is multi-dimensional, relative, serial, independent of space, and invested with so many properties that, like the ether of classical physics, it is patently absurd. Meanwhile, we are content to make it, save it, use it, spend it, enjoy it and even kill it.

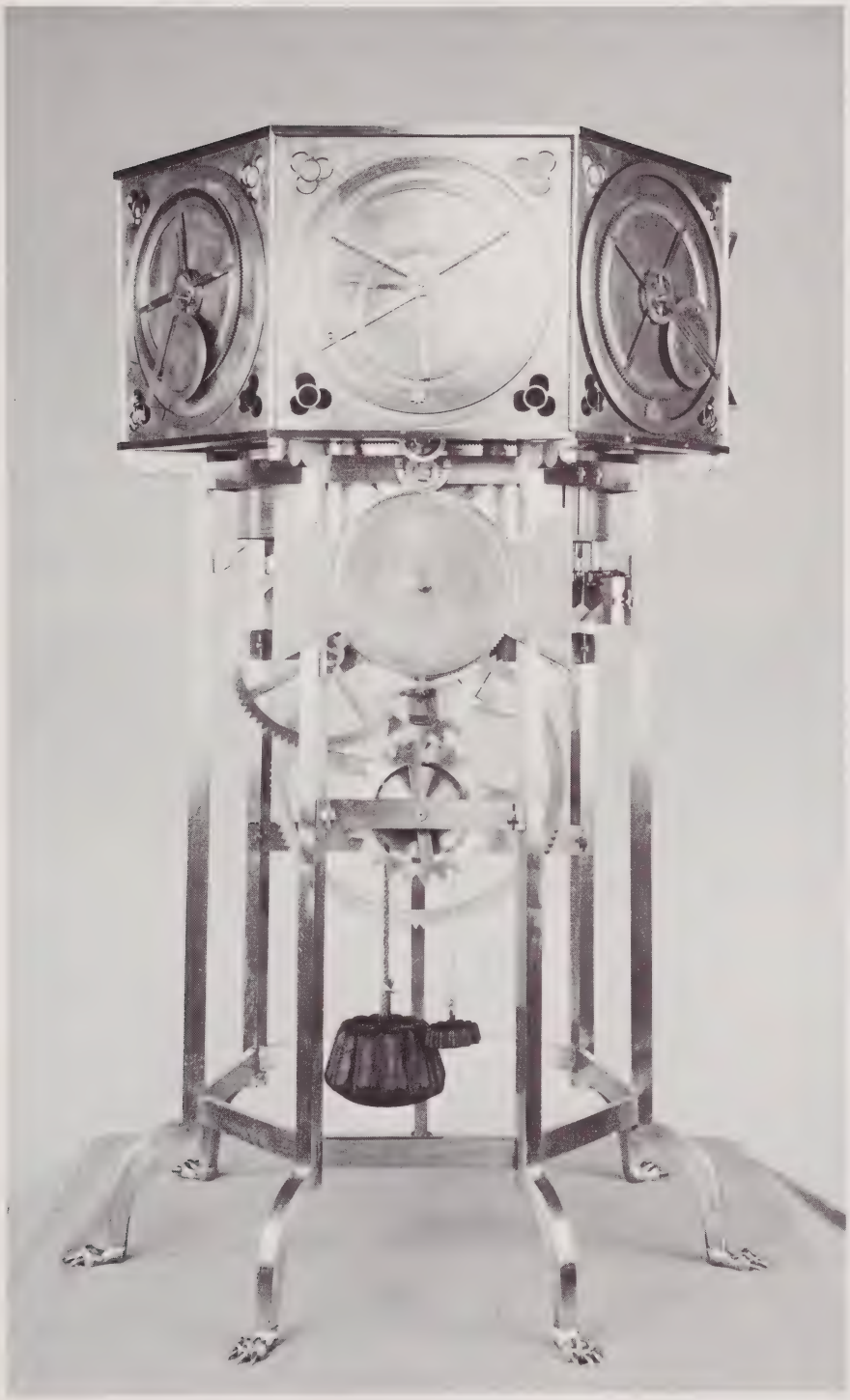
In our present age, with its multitudes of clocks and watches, it is an easy matter to "know" or "tell" the time. We have merely to notice the positions of hands relative to a scale of numbers and assume that the mechanism of the clock is working correctly. We need know nothing about concealed power sources, wheelwork and escapements, and certainly nothing about the nature of time itself. Yet the motion of an hour hand represents nothing less than that of an idealized sun that moves sometimes faster and sometimes more slowly than the real sun.

The sun rather than an hour hand is the main dictator of the passage of time. Early in our history, and more than any other celestial object, its regular rising and setting provided two important time-signals in the conduct of human affairs. Further, its position in the sky, reflected in the length and direction of the shadow cast by a vertical stick, gave a good indication of the progress of daylight. These signs led eventually to the institution of hours, obtained by dividing the interval between sunrise and sunset into 12 equal parts. Hours of this kind are called *temporal hours*. They vary in length according to the seasons and were not generally replaced by modern hours until after the advent of the first mechanical clock towards the end of the 13th century.

Even then the sun remained arbiter of time, for early clocks were notoriously bad timekeepers. They had only one hand, the hour hand, and could often depart from regular motion by as much as 30 minutes a day. Only seldom did they agree with the indications of a good sundial, and in any case, as medieval astronomers knew only too well, the sun itself is not a particularly good timekeeper. Its motion, relative to the stars, is by no means uniform, owing, as we now know, to the non-uniform motion of the earth round the sun. Consequently, a mean or fictitious sun had to be invented, a sun that moved regularly round the equator of the heavens. Clockmakers and the public they served had no option but to depend on astronomers for the last word regarding natural time cycles.

Astronomers also became involved in the preparation of calendars, for these required an understanding of other natural time-cycles, in particular the length of the tropical year and the period of phases of the moon. The former, equal in length to about 365¼ days, is the time taken by the sun to travel once round the zodiac. After this interval the sun is roughly back where it started in relation to the background of stars.

The moon's phase cycle, however, has a period of about 29½ days. Known as a lunation, it is the time between one new moon and the next successive new moon. In early times the moon became an important natural indicator of time, especially in agricultural communities,



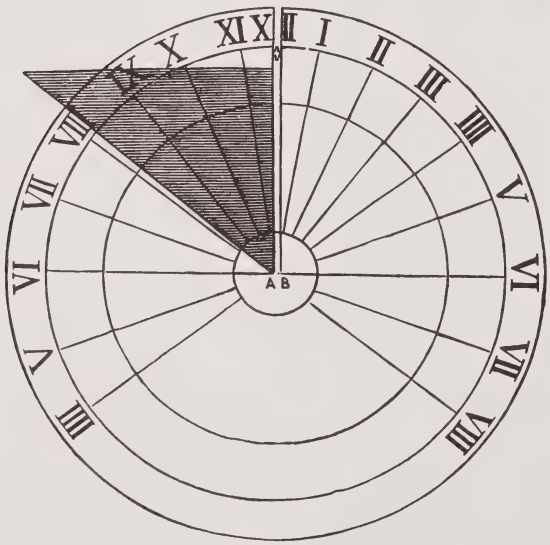
Stonehenge, seen at twilight from a point on its main axis. Many scientists surmise that 3500 years ago it timed the beginnings of the seasons, and the moment of the first sunrise of summer is still pinpointed from Stonehenge by sighting along this axis.

A reconstruction of Giovanni de Dondi's astrarium (completed 1364), a complex astronomical clock. Photo courtesy of The Science Museum, London, England.

and much effort went into attempts to correlate the lunation with the tropical year. The first major success in this direction came in the 5th century B.C. when the Athenian astronomer Meton announced that 19 tropical years are almost equal to 235 lunations. We now know that the relation was discovered earlier by the Babylonians, but in Meton's age its importance caused it to be inscribed on public monuments in letters of gold. It greatly simplified the preparation of long-term almanacs and calendars, and in later centuries assisted in finding the date of Easter.

Another problem was the length of the tropical year with respect to the 365 days of a civil year. Regulation of a kind was achieved by occasionally adding a day, and in order to match up the year with the lunations or "months," inserting an extra month from time to time. The calendar reform of Julius Caesar, instituted in 45 B.C., was a direct result of the confusion produced by these procedures. As the historian Suetonius remarked, the pontiffs had so abused their privilege of adding months or days at pleasure that harvest festivals did not come in the summer, nor those of the vintage in the autumn. Caesar's reform, an excellent one at the time, allowed the lunation to wander at will through a calendar year of 365 days. The odd quarter-day was allowed for by inserting an extra day in the month of February once every four years. This was done by the not too satisfactory expedient of counting February 24 twice; since this day was the sixth day before the kalends of March, our present "leap" years were originally called "bissextile" years.

Basic to the new calendar was the division of months into Nones, Ides and Kalends. These were not replaced by the Syrio-Babylonian seven-day week until the 4th century, when



A 17th-century craftsman's working drawing of a sundial. The making of an accurate sundial requires complex mathematical calculations, since exactly equal spaces for the hours can be allotted only for equatorial locations. This drawing shows the correct hour divisions for a horizontal sundial to be used in London.

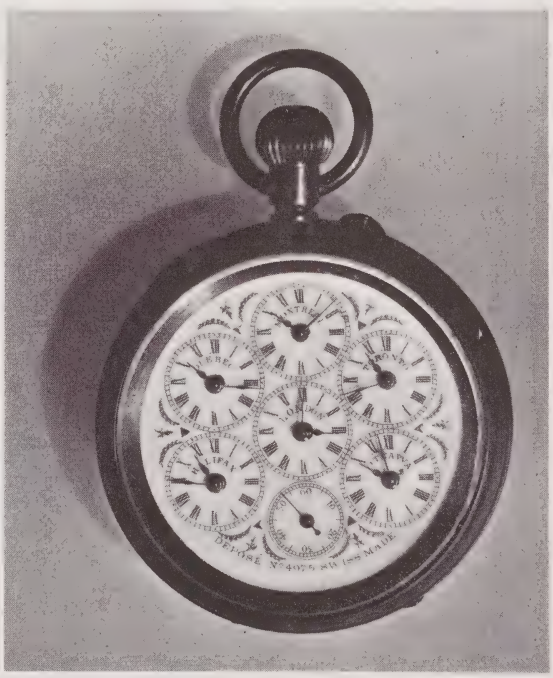
An 18th-century engraving, The Mistress of Horology. *Photo courtesy of the Musée des Arts Décoratifs, Paris.*

Constantine the Great found the idea of a holy day or sabbath appealing. The choice of a sevenfold division is most probably related to the distinction drawn by the Babylonians between stationary celestial bodies or stars, and the seven wandering 'stars' or "wanderers"—the sun, the moon, and the five planets visible to the unaided eye. Nevertheless, Constantine failed to allow for the fact that 52 weeks of seven days each do not constitute a year of 365 days. Hence consecutive New Years failed to begin on Sunday, the first day of the Christian week, and various Church festivals, including Christmas Day, wandered freely among the weekdays.

In 325 A.D. the Church Council of Nicaea ordained that Easter Day should be the first Sunday after the full moon falling on or next following the vernal equinox. Since the vernal equinox then fell on March 21, Easter Day could occur any time from March 22 to April 25, but at least it was a spring festival. This seemed reasonable enough at the time, but as the centuries passed a major defect in the Julian calendar became increasingly evident. Its sequence of three years of 365 days each, followed by one year of 366 days, gave the tropical year a mean length of 365¼ days, whereas its actual length is shorter than this by about 11 minutes 14 seconds.

As a result, the equinoxes fell earlier and earlier in the calendar year and Easter moved away from the spring season. During medieval times various attempts were made to introduce some suitable reform, but nothing effective was done until 1582. In that year, when the vernal equinox fell on March 11, Pope Gregory XIII, acting on the advice of papal astronomers and other advisers, decreed that the date of the vernal equinox should be restored to March 21. This meant omitting 10 days from the calendar or, more precisely, calling the day following October 4 of that year not October 5 but October 15. To prevent further dislocation, it was also decreed that only those century years which are divisible by 400 should be considered leap years. By this rule 1700, 1800, 1900 were not leap years but 2000 will be a leap year. Even so, there is still a small uncorrected error, but it is no more than about a day in some 3,500 years.

Although the new calendar came into operation at once in those countries which acknowledged allegiance to the Pope, the Eastern Church and most Protestant countries refused to adopt it. The mathematician John Dee apparently convinced Queen Elizabeth I that the change was worth adopting, and a Bill was presented to Parliament in 1585 to this effect, but it got no farther than a second reading. Germany adopted the Gregorian calendar in 1699, Denmark followed suit a year later, but England kept aloof until 1752. By that time the equinox on the Julian basis was 11 days out of step with that calculated by the Gregorian calendar. A further complication in England was that the civil year began on March 25 and the historical year on January 1, so that dates like March 24, 1751/2 were not uncommon. In these



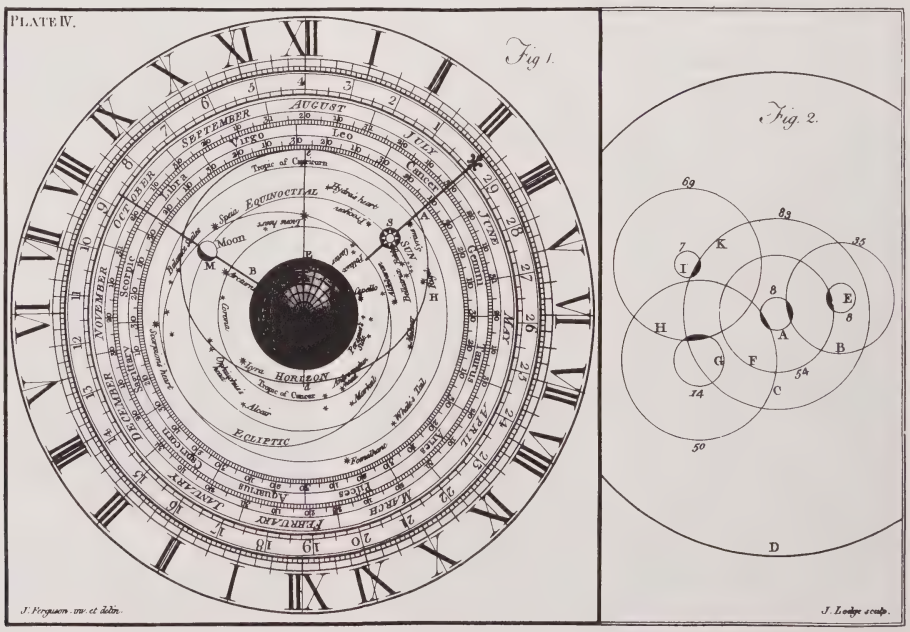
Swiss watch (c. 1875) with separate seconds dial and six time dials for London, Montreal, Quebec, Toronto, Ottawa, and Halifax (ROM 928.29.79). *Gift of J. Sutcliffe Smith*

cases the numerator of the fraction indicated the civil year and the denominator the historical year.

The adoption of the new calendar in England was due largely to the Earls of Chesterfield and Macclesfield, assisted by the Astronomer Royal, James Bradley. In 1752 Parliament decreed that the day following September 2 should be called September 14 instead of September 3. The change was not made without great inconvenience, and despite the care taken to guard against injustices, riots broke out in various places. Many people, forgetting that calendars are man-made rather than heaven-sent, complained that they had been robbed of 11 days. Several were scandalized at what they regarded to be an irreligious meddling with the sacred festivals of Easter and Christmas. Some looked forward to the blossoming of the famous Glastonbury thorn with some anxiety, but needlessly so, for the cooperative bush flowered before Christmas Day of the "New Style."

There is no denying the fact that the Gregorian calendar, still in use in many countries, is by no means ideal. The days of the week vary in position in different months and in the same months of different years; only once every 28 years does the calendar of any one year exactly reproduce itself. An essentially weekday anniversary can occur on a Sunday, Christmas day wanders among the days of the week, and Easter arrives sometimes in March and sometimes in April. The inequality of the calendar months, a legacy of the old Julian calendar, means that quarter years are unequal. This adds an unnecessary complication to reckonings in commerce and business, for the payment of salaries, pensions, rents and interests is often arranged on a quarterly or half-yearly basis.

The defects of the Gregorian calendar, together with ways of correcting them, have been discussed from time to time at various international conferences. They received the earnest consideration of The International World Calendar Association, the idea of a perpetual calendar was considered by the League of Nations in 1923, and again by the United Nations in 1949, but all without success. Further confusion has arisen from the institution of Summer Time, time standards and time zones. There are still those who claim that it is against divine law to meddle with the calendar, that it would be in-



Design for the dial of an astronomical clock to show time of year, positions of the sun and moon, and visibility of the principal stars. By James Ferguson, c. 1773.

tolerable to have one's birthday always on a particular day of the week, that there must of necessity be 7 days in a week, and that some of the proposed calendar changes might deprive millions of people of their birthdays. All of which shows that we are slaves of time largely through our own fault, at least as far as the calendar is concerned.

On the brighter side is our partial emancipation from such natural time "standards" as the periods of the earth's rotation and orbital motion round the sun. The earth is an extremely poor timekeeper when compared with a caesium atomic clock, whose error accumulates to a second only after the passage of many centuries and which can split a second into 10,000 million "ticks."

And yet, for all the accuracy and sophistication of today's time-keeping devices, we are still far from being able to say what time *is*.

"It's About Time" is the title of the early summer show at the McLaughlin Planetarium, which explores some of the deeper questions about the nature of time while considering the evolution of time-keeping over the ages.

Water clocks are more accurate and more adaptable than hourglasses and were used all over the ancient world. In this Chinese version, containers were marked off into divisions of time, and water emptied from one container into another.

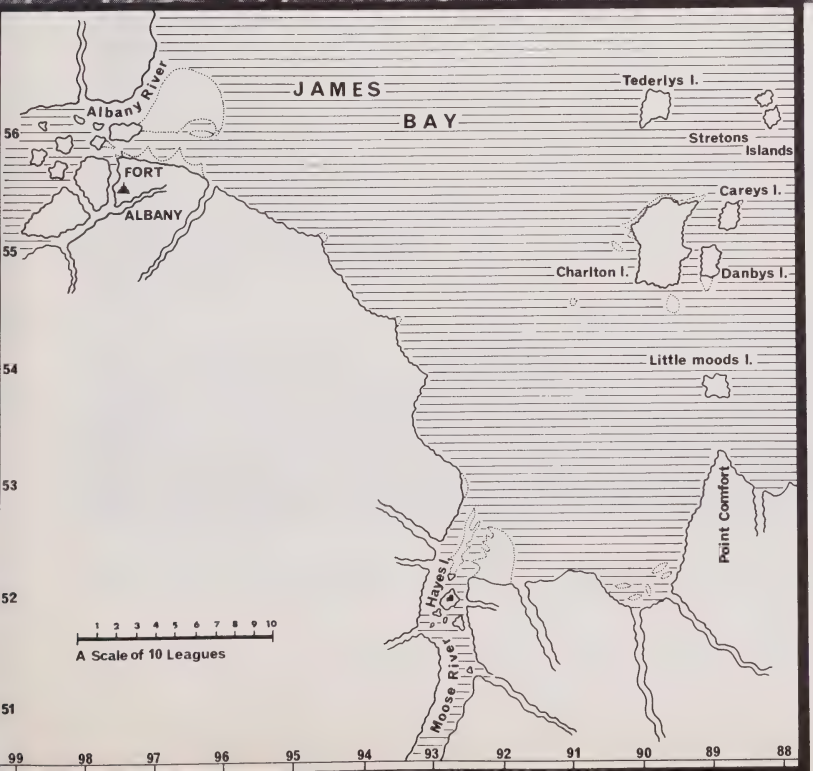
Henry C. King's interest in astronomy began at the age of 13, and his fascination with the night sky led him to study optics and to build his own telescopes. He took his degree in astronomy and mathematics at the University of London, and later gained his M.Sc. and Ph.D. in the history and philosophy of science. In 1958, Dr King was appointed scientific director of the London Planetarium, and at the same time served as President of the British Astronomical Association. He was appointed Curator of the McLaughlin Planetarium at the ROM in September, 1966. Dr King is the author of several books, including *The History of the Telescope, Exploration of the Universe* and *Pictorial Guide to the Stars*. He is currently working on a detailed history of astronomical clocks, soon to be published.

SEARCH FOR THE PRUDENT MARY

W. A. Kenyon

A ship that is known as the *Prudent Mary* may, with some justification, be accused of temerity. And that, perhaps, might explain her fate. For she was wrecked on a reef to the north of Charlton Island in 1680.

The *Prudent Mary* was a vessel of some 140 tons that had been chartered by the Hudson's Bay Company to take supplies and trade-goods to the Company posts on James Bay, and to bring the accumulated furs back to England. She discharged her cargo at the depot on Charlton Island, loaded the furs that had been collected there from the posts at the mouths of the Rupert, Moose and Albany Rivers, and then headed for home. Normally when a vessel left her anchorage at the depot, she would have sailed with the tide



Abandoned Hudson's Bay Company post on Charlton Island.

Photographs by the author; maps by J. Hosek.

across the bay on the east side of the island, heading for the Struttons. Once she had cleared the reef that lies off the north-east point of the island, she would have swung around to the west north-west till she was past Trodley Island, and then steered 337°, keeping to the west of the string of islands down the centre of the bay.

For reasons which we will never know, Captain Richard Greenaway, master of the *Prudent Mary*, grounded his vessel on a reef near Trodley Island where it was ultimately destroyed. Perhaps he was blown off course in a storm or fog, but more likely he simply hit a reef or shoal that even today is still uncharted. The crew escaped to Fort Albany in the ship's boats, and most of the cargo of furs was salvaged later, as were some of the ship's cannon. John Nixon, bayside governor for the Hudson's Bay Company, sent a small boat to the reef to see if he could salvage some of the planking from the damaged vessel. He hoped to use it in the construction of a small warehouse that he was building on Charlton Island at the time, but his men reported that the wreckage had been burned. All they brought back was a small anchor which Nixon said would no doubt stand them "in good steed around the yaught."

Over the years, the wreck of the *Prudent Mary* was forgotten. The rise and fall of the tides and the hammering of storm-driven waves would slowly iron out any irregularities in the reef profile, while heavy objects would gradually bed down in the sand and gravel till almost nothing was visible. Then, a few years ago, a small boat anchored in the shelter of a tiny island to ride out a storm. After the storm had blown itself out, one of the crew noticed some large tubular objects lying on a reef, half buried in the gravel. A closer look showed that they were cannon. When the discovery was reported

Aerial view of Charlton Island, where the Prudent Mary *was lost.*

Wreck of the Sorine.

to me, I simply filed it away—after my initial excitement—till I could find an opportunity to visit the area.

Meanwhile, I continued my research into the early history of James Bay with particular emphasis on Captain Thomas James himself. The fact that James spent the winter of 1631-32 on an island in the bottom of the bay that was eventually named after him is fairly widely known. But details of his voyage, and particularly of his wintering at what he called *Charles Town*, or *Charlton*, are obscure. And it was these details with which I was primarily concerned.

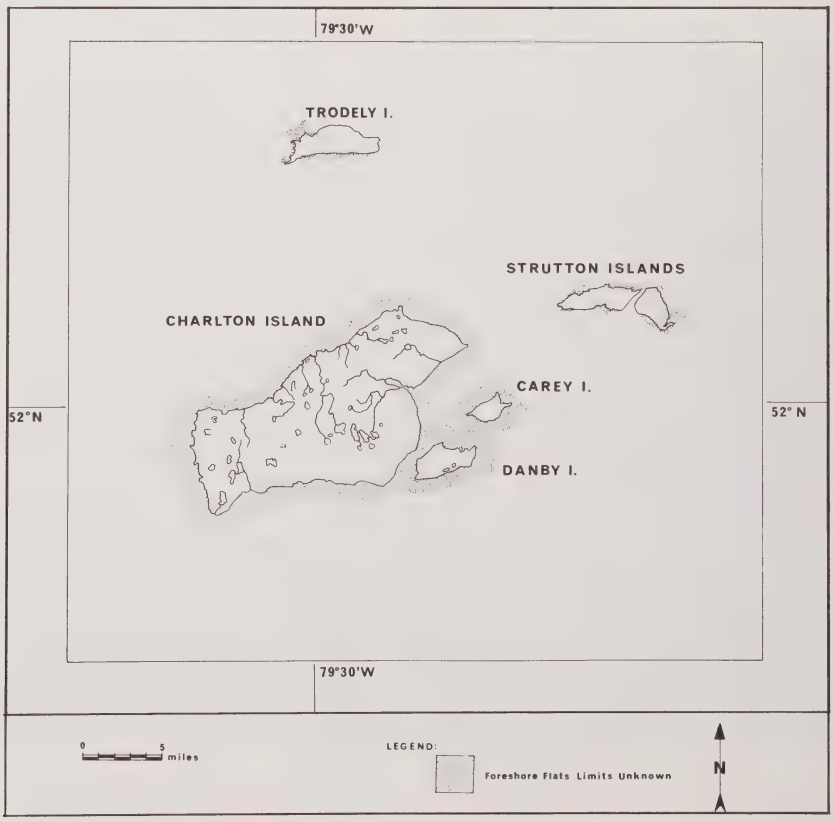
Where, precisely, was the tiny settlement where James had spent the winter? Which of the sandy dunes and ridges that make Charlton Island so lumpy did he call Brandon Hill? Would it be possible, 340 years later, to locate the graves of William Cole the carpenter, and John Warden the first mate, both of whom had died of scurvy and were buried there, as was Richard Edwards, the gunner who died following an accident which "wrung off his foot"? And finally, where are the King's Arms and the Arms of the City of Bristol which James had "fairly cut in lead" and fastened to a large cross on Brandon Hill where he had so solemnly buried his dead? The latter, particularly, would be priceless historic relics if they could be found.

Last spring, I became convinced that I could probably locate the spot where James had spent the winter of 1631-32, as well as the sand-dune that he named Brandon Hill. I had arrived at that decision largely through a detailed study of James' journal, although I garnered a considerable body of supportive data from later explorers, early maps, and even such unlikely sources as the *Labrador and Hudson Bay Pilot*. Although this is not the place to present the evidence in support of my view, I had become quite certain that James' wintering place was at, or very close to, the spot that is indicated on the map. With this knowledge—or at least, this level of confidence—I visited Charlton Island last summer with two specific objectives in view: 1) to locate the remains of James' wintering place, and 2) to locate, and salvage if possible, the cannon from the wreck of the *Prudent Mary*.

In terms of my specific objectives, the expedition was a dismal failure. Only after repeated postponements because of thoroughly improbable weather did I learn that the spots

Planks of the Sorine *at low tide.*

Estimated extent of shoal water surrounding Charlton Island.



I was interested in could not be visited by air. I thought that the pilots of Austin Airways were being overly cautious when they insisted that the only safe place to land a float-plane in the entire area was at the old Hudson's Bay Company's depot on Charlton Island. But if that was the only place they would land me, that's where I would go. A 16-foot fibre-glass canoe which could be lashed to the pontoon of the Otter would be quite adequate for at least a coastal survey of Charlton, and a quick nip over to Trodley Island.

My first visit to Charlton was on Sunday, July 23rd, when I made a brief aerial reconnaissance of the area. Flying northeast from the mouth of the Moose River on a beautiful clear day, we could soon see Sawayan Point off to our right, the waves breaking against Lisbon Rocks to our left, and both Danby and Charlton Islands dead ahead. Our course was leading us directly over the old depot on the southeast point of the island, and from a distance, one of the hills mentioned by Thomas James was clearly visible on the horizon. As we got closer, a fog-bank slowly but inexorably erased the Strutton Islands, far ahead, and moved swiftly towards us. By the time we arrived over the depot, most of Danby Island had disappeared into the fog, while the northeast point of Charlton was already dissolving. We hurried eastward, but got only a glimpse of the area where James wintered. Then, swinging around to the north, we headed for Trodley Island, but the fog was becoming so thick that we admitted defeat and scurried back to Moosonee, and then to Toronto.

I returned to Moosonee on August 2nd with two crew members, and spent the afternoon assembling the grub, swede saw, axe, rope, cooking gear, etc. etc. that we would

Low tide.

Evening view.

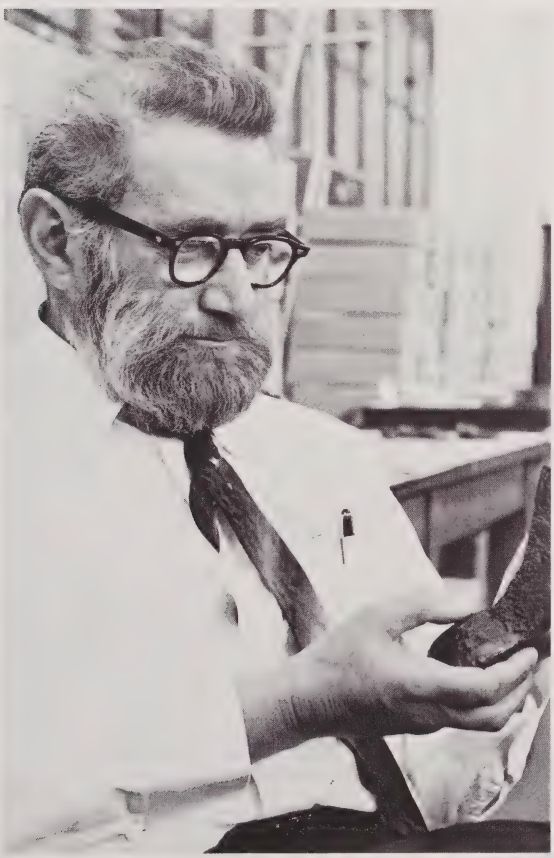
need. By 7:00 that night, everything was packed and assembled at the airbase, ready to leave the next morning on a chartered Otter. The weather was deteriorating rapidly, but I was not unduly alarmed. At 6:30 the next morning, there was solid overcast, not a breath of wind, and a light but steady drizzle. After breakfast, I told the crew that there was no problem, that such delays were frequent in the north. Five days later, when we finally got away, I was not nearly so philosophical. I was still quoting Milton to the effect that "They also serve who only stand and wait," but I had been saying it with less conviction each time. At 8:45 a.m. on Monday, August 7th, however, we were air-borne, and finally heading for Charlton Island.

We landed near the remains of the Hudson's Bay Company dock on the point opposite Danby Island, heaping our gear on the sandy beach just above the high water mark. We then inspected the three old buildings on the site, and decided to move into the one sitting on a low bluff just north of the landing. As soon as our gear was under cover, we located a source of drinking-water, set up a marker to check the tides, and then went exploring.

To the north of our camp, there was a small point where the shore curved around to form the deep indentation where James had hoped to winter his ship. As I sat on the bluff above the point, examining the coast to the north, the tide slowly ebbed, exposing a reef that stretched perhaps a mile and a half out into the bay towards Carey Island. A line of boulders marked its northern edge, and I suddenly realized why Austin Airways was so insistent about landing their aircraft only at the old depot. I also realized, for the first time, that Thomas James was not exaggerating when he tabulated the horrors of trying to winter a ship in that bay. We spent 10 days on Charlton, and whenever there was a break in the weather—which wasn't too often —I studied the bay. Each time that I discovered a new reef or shoal, my 16-foot canoe seemed to grow shorter. And like the Breton fisherman, I kept reminding God that my ship was so small and His sea was so vast. And I never did get across that bay!

Near our camp and visible on the shore at low tide, was the wreck of a ship, the *Sorine,* a Danish vessel that was wrecked there about 1910. And then one day, the corner of an old flemish brick was seen sticking out of a bank. This caused much excitement, as we knew that there had been a very early depot on the Island, the one that Nixon was building when the *Prudent Mary* docked at Charlton Island in 1680. Although old flemish bricks and similar archaeological debris present a serious threat to the equanimity of historic archaeologists, I managed to restrain my enthusiasm. We carefully brushed away the loose dirt, picked up a few artifacts, noted what was probably part of an old wooden floor, and then reluctantly but firmly covered up the exposed area with loose sand.

There is no doubt whatever as to the age of the historic material that we found on Charlton. The hand-blown bottles, kaolin pipe-stems and flemish bricks all date from the late 1600s or the very early 1700s. So this summer, if the necessary arrangements can be made, I will return with a good, seaworthy boat, excavate the old depot, and continue my search for the wintering place of Thomas James, and the wreck of the *Prudent Mary.* And from time to time I will remind the crew—and myself—that fates should never be tempted.



Walter A. Kenyon studied archaeology at the University of British Columbia, and received his Ph.D. from the University of Toronto in 1967. Since he joined the ROM in 1956, his archaeological research has taken him from the barrenlands west of Hudson Bay to the West Indies and Central America, though his special interest is the pre-history and early history of Ontario. In the preparation of this article on the *Prudent Mary*, Dr Kenyon is particularly grateful for the assistance of: The Ministry of Colleges and Universities; Commissioner Hodgson and his staff in the Government of the Northwest Territories; Brian Norris, Deputy Chief Ranger, Ministry of Natural Resources, Moosonee, Ontario; Doris Baldwin, Scott Cameron and Neil O'Brien of Austin Airways; and finally, Diane, his 14-year-old daughter who, he insists, can bake delicious biscuits over an open fire in the rain.

A NUMISMATIC PUZZLE

Mary Campbell

A small collection of French silver coins acquired by the ROM in 1911 has only recently been catalogued. Their condition ranges from fine to average. Among them are five good examples of the *gros tournois*, first issued by Louis IX (St. Louis, 1226–1270) and one of them is a coin of his reign (fig. 1). When the rest of the collection had been catalogued, nine small coins, the size and appearance of a *denier*, remained a puzzle.

Four of them have, on the reverse, the words THEBANI CIVIS, indicating that they were minted at Thebes, and the obverse declares the ruler to be Dux Atenes. Who on earth was the Duke of Athens?

The Crusades seemed a reasonable point of departure for a search. The relevant article in the *Encyclopaedia Britannica* told of the Fourth Crusade stopping at Constantinople in 1204 on the way to Jerusalem to reason with the Emperor of the East on behalf of the Pope. After accepting the Emperor's hospitality for a year or so, the Crusaders proceeded to sack his city and carve up his empire.

...a French Duke of Athens?

The article on Athens yielded furthur information: Athens and its vicinity, with Euboea, fell to the lot of the de la Roche family, which held the area from 1205 for over a hundred years. In 1258 it became a duchy under Louis IX of France. The seat of government was Thebes, which was also the site of a mint. William Miller remarks (*The Latins in the Levant,* London, 1908, p. 66) that Greece was to the younger sons of the French nobility in the 13th century what the British colonies were in the 19th century to impecunious but energetic Englishmen. Thus the puzzle was solved. One of our coins is a *denier* of Guillaume I (1280–1287), and three others are *deniers* of Gui II (1287–1308) (fig. 2).

The other five coins were minted by the Princes of Achaia. Two are *deniers* of Philippe de Tarente (1307–1313) struck at Lepanto, and another is a *denier* of Charles II d'Anjou (1285–1289). The last two are *deniers* (fig. 3) of Florent de Hainaut and Isabelle de Villehardouin (1289–1297).

Fig. 1. Gros tournois, *diameter 25 mm.*
Fig. 2. Denier *of Gui de la Roche, diameter 19 mm.*
Fig. 3. Denier *of Florent de Hainaut and Isabelle de Villehardouin, diameter 19 mm.*

On the reverse of the last three coins are the words DE CLARENCIA. But where was Clarencia?

Patient search through *Spinks Numismatic Circular* found lists covering several pages of coins of the many principalities of the Latin Empire of the East (vol. VIII column 4252f). The first time "De Clarencia" appears on the list it is followed by the italicised statement "Minted at Clarence." This helped not at all, since a search in the Gazetteer of our largest atlas revealed at least a dozen places called Clarence in the U.S.A., but not a single one in Europe. Here was another puzzle. The general reference for the Spinks list was G. Schlumberger, *Numismatique de l'Orient Latin* (Paris, 1877), and once the 1954 edition of this book was obtained the end of the search was in sight. The name Clarencia appears in a variety of forms—Clarentza, Chiarenza, Glarenza—and here the Gazetteer was more helpful. Chiarenza was identical with a tiny town on the westernmost part of the Peloponnese called Kyllene or Cyllene now and in antiquity. Its only claim to fame today is the ruin of a 13th century castle. This was the castle of Clairemont, or Clermont, built by Geoffrey II Villehardouin (1218–1245) in his capital. It was later known also as Castel-Tornese or Chateau Tournois, after the *deniers tournois* struck there by the Princes of Achaia. Schlumberger remarks (p. 310) that the very existence of Clarencia is forgotten today, except in the English royal title Duke of Clarence.

But alas for such a neat conclusion. According to the article on Clarence in the *Encyclopaedia Britannica* the first Duke of Clarence was Lionel of Antwerp, third son of Edward III. The title was created for and conferred on him in 1362 when he married the heiress of the famous family of Clare, and the *Encyclopaedia* states categorically that the name Clarence derives from Clare.

Mary Campbell was born in Ste. Agathe des Monts, Quebec. She was educated at the Bishop Strachan School and Trinity College, Toronto, and came to the ROM in 1939 as an assistant to Dr Currelly's Assistant. In 1941 she became secretary to Dr Currelly until his retirement in 1946. She was then secretary to Mr Brett and to Dr Tushingham in the Main Office of Archaeology until 1960, when she moved to the European Department as the Department Secretary. Her interest in coins is a long-standing one, and she has identified coins for the public ever since she came to the Museum.

The Growing Collections

There have been several important additions to the ROM Textile Department's collection of 18th century costume, two of which are of particular interest because they are rare. One is a woman's overdress from about 1735 (972.433.2), of heavy silk brocaded with coloured silks and gold and silver filé. The flowery pattern is in the style of the 1730s and the overdress has the flaring cuffs fashionable at that time. Costume dating from before 1750 is rare, and this, the gift of Mrs Saul A. Silverman, is now the earliest example of 18th century dress in the collection.

The other costume of interest is a mid-18th century boy's coat with matching waistcoat, both of blue ribbed silk and trimmed with silver lace (972.486). 18th century children's costume is extremely rare, and this charming example, gift of the Fashion Group Inc. of Toronto, is the first of its kind to come into the collections.

Both the Fashion Group and Mrs Silverman have generously supported the Museum with gifts of costume. Much of this has been couturier clothing, but recently they have extended their support to enable us to acquire costume of the 18th century.

Two small celadon-glazed stoneware figures (972.364.1 & .2), each depicting a woman holding a child, have been added to the collection of the Far Eastern Department. Such female maternity figures are typical of 14th-15th century figurines found in great numbers in the old Thai city of Sawankolok and in the kiln sites north of the city. Strangely, most of the women have had their heads broken from their bodies, and those still intact generally give the impression that the head and body were modelled separately and joined lightly before firing.

This peculiarity has given rise to an interesting theory. If the word *kabān* in the Thai name for the figurines, *tukatā sia kabān*, is traced back to the Sanskrit word for skull, *kapāla*, then the translation of the Thai term is "a doll to decapitate". M. George Coedès has suggested that these dolls were broken in a rite intended to transfer the dangers of childbirth from the mother and child to the ceramic doll.

Until recently the Far Eastern Department had few Southeast Asian ceramics, but the generosity of Mrs George G. R. Harris and Mrs Edgar J. Stone has enabled us to display a case of these subtly coloured wares.

The Canadiana Department recently added to its collections a Quebec joined straight chair (973.25.4), maple, of a simple Louis XIII type, late 17th century, originally from the furnishings of the Hotel Dieu, Quebec. It has been illustrated as no. 274 in Palardy's *Early Furniture of French Canada.*

Over 200 specimens have been registered into the Mineralogy collections since November. The most important are four species not previously represented: calcurmolite from France; bottalackite from Cornwall, England; tsumcorite from Tsumeb, South West Africa; and westerveldite from Thompson, Manitoba. The westerveldite is in a polished section and was presented by Dr C. Duesing and Mrs M. Sizgoric of the INCO laboratory at Sheridan Park. Prof. Guy Perrault of the Ecole Polytechnique presented part of the type specimen of lemoynite from Mont St. Hilaire, Quebec. An unusual pseudomorph of tennantite after azurite from Tsumeb, South West Africa was presented by Mr J. Rossouw of Johannesburg, South Africa. An exchange was completed with Mr Elmer B. Rowley of Glens Falls, N.Y.

Some interesting and attractive specimens were purchased at the Tuscon Gem and Mineral Show in Arizona. Of these, an unusual emerald green cuprian adamite from Tsumeb, South West Africa and a fine faceted 3.5 carat rhodochrosite from Colorado are of special note. Another unusual gem purchased in Tucson is a 2.4 carat faceted blue-green phosphophyllite from Bolivia. Both these minerals are unusual as faceted gemstones. Shown is an attractive group of gypsum crystals purchased from Mexico, the largest of which measures $12 \times 8 \times 4$ cms.

Top, sargassum fish in its natural colour, taken from planktonic sargassum weed.

Bottom, same species which has altered its colour pattern to better match its surroundings of near-shore brown algae.

Right, scientific crew sorting through sargassum aboard C.S.S. Dawson.

AFLOAT AND ASHORE IN THE CARIBBEAN

E. J. Crossman

Photographs by A. R. Emery and the author.

The Caribbean is of interest to a Canadian museum ichthyologist for a number of reasons. First, its marine fish fauna is large (about 800 species), varied, and complex in ecological relationships, providing study opportunities imperative for a thorough understanding of the world of fishes. This type of experience is particularly important for someone who, like me, normally works with the small, strikingly less varied, Canadian freshwater fauna of only 181 species. A study collection of fishes used for university teaching, as is that at ROM, would be inadequate without presentatives of Caribbean fishes.

Caribbean waters are also the spawning grounds or nursery area for a number of species commercially important to Canadian fishermen, among them the swordfish, several tunas, various sharks, and the American eel. The fishes of the Caribbean are one of the main sources of protein for the islands, but very little technical information is available on them and the fishermen of the different islands often refer to the same species by different names. One of the responsibilities of a department of Ichthyology is the provision of information on the identity, relationships, and basic biology

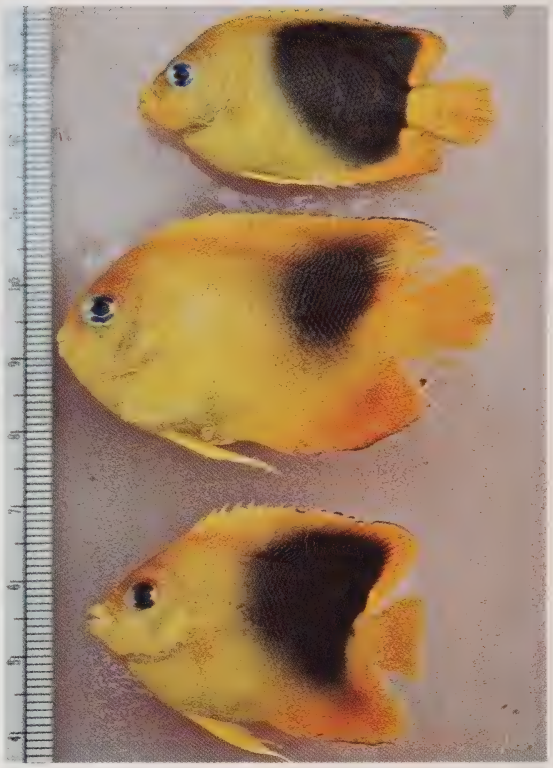
of fishes. This information can be utilized by others in the management and exploitation of the fishes concerned.

Moreover, the hoped-for expansion of the museum may provide exhibition space in which to extend the fish gallery to include a display of coral-reef fishes. Caribbean studies provide experience, study materials, and documentary photographs which would be necessary for an authentic display of these beautiful and interesting marine animals.

For all these reasons the Department of Ichthyology at ROM initiated, about 1963, a study of the fishes of the Windward Islands.

Dr. W. B. Scott of the Department of Ichthyology and Herpetology is carrying out studies of the fishes of the North Atlantic Ocean, in close liaison with the Fisheries Research Board of Canada of the Department of the Environment. That federal agency shares some of the interests in the Caribbean and irregularly arranges for Canadian research vessels to work in the Caribbean area. As a result of Dr. Scott's involvement, and of this common interest, it has been possible for various staff members of our department and University students associated with it to participate in several of these scientific cruises. In addition, the department has had shore-based field parties in Trinidad, Tobago, the Grenadines and Barbados.

In February 1972 Peter Buerschaper, Chief Technician of this department, and I boarded the Canadian Government Research Vessel *Dawson* with the scientific crew from the St. Andrews, New Brunswick Biological Station of the Fisheries Research Board. The purpose of the cruise was to gather information on the young and adults of the swordfish and tunas. The cruise plan called for 2500 miles of steady steaming from St. Andrews to Curaçao, Netherlands Antilles, 50 miles north of the coast of



Three individuals of the reef fish called rock beauty showing change in colour pattern with change in size.

Mixed bag of fishes from a single collection in St. Lucia.

Venezuela. Not only did we not go ashore along the way but we sighted land only twice. The ship had three speeds, 15 knots between stations, 4 knots on fishing stations and dead stop for oceanographic stations.

Peter and I were aboard to acquire for the ROM research collection those specimens not needed by the FRB for its studies. We were not, however, simple guests but an integral part of one of the three-man scientific watches with four hours on hand and four hours off, responsible for carrying out all oceanographic and fisheries research activities scheduled for that four-hour period. These involved lowering and retrieving salinity and temperature sample bottles, setting and emptying nets, sorting the small fishes from the other minute organisms in the net catches and maintaining the multitude of records required. As it worked out, our interest in the selection and proper preparation of the specimens actually led to our being on deck for all catches around the clock, with sleep fitted in whenever possible.

Some of the more interesting animals came from small nets sieving the top 12 inches of the sea. Leaning over the ship's rail, as we passed through the area of the so-called Sargasso Sea, we often half-hoped that the nets would skip over the huge windrows of floating sargassum. In this area the nets came aboard laden with tubsfull of the vegetation, all of which had to be picked over, piece by piece, in order to separate the animals associated with it. A typical inhabitant is the small sargassum fish which lives literally in and on the floating vegetation, and is coloured so as to be almost invisible among the fronds of the sargassum. It rarely grows more than 4 inches in length, and spends most of its life literally crawling over the floating vegetation. The sargassum fish, an interesting tropical species, is occasionally found in Canadian waters.

At night these same nets would capture fishes which came to the surface of the sea only after dark. These included various lanternfishes which produce light in special organs regularly arranged about the body in patterns by which we, and apparently other lanternfishes, recognize the different species. At night flying fishes were also more active. The young were taken by the nets, and adults would regularly so badly misjudge their gliding flight as to

Sharks caught on the long line.

land on the deck. As often as possible these gastronomic treats were quickly snapped up by the ship's crew, rushed away to the galley, and cooked before we knew they were even aboard.

Along with the typical, obviously fish-like, young of many species, the nets captured large numbers of the young of various types of eels. These are up to twelve inches long, about ½ inch deep, ribbon-like, and virtually transparent. Except for dark eyes and some pigment on the head and body they could be mistaken for soft, flexible strips of clear plastic. The special cases mentioned above constituted only a small proportion of the specimens taken by the nets. The meticulous job of sorting and identifying thousands of these sometimes minute fishes is presently under way in our department.

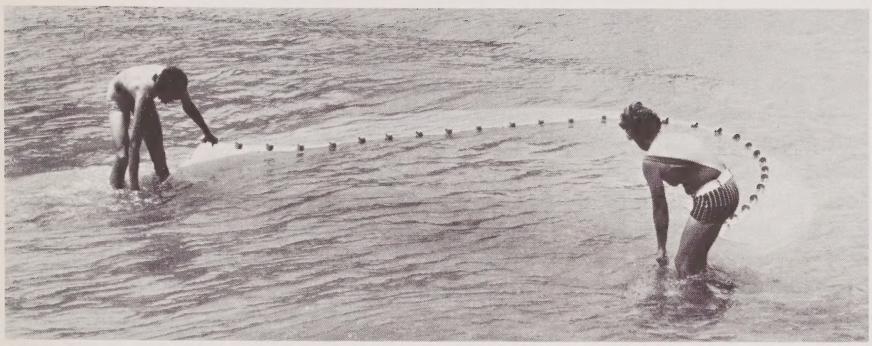
At less frequent intervals, the whole crew was involved in the setting and retrieval of another type of gear—4 miles of buoyed "long-line" with 500 hooks, each baited with a whole mackerel. The long-line was set out at dusk. The vessel remained overnight close by, in visual, radar, or radio contact with the set, and the gear was retrieved in the early morning. Our abbreviated long-line was a research modification of its commercial counterparts which are often up to 50 miles long. This most dramatic part of the work had all the interest of angling, as we had no way of knowing whether the long-line would catch nothing, or whether it would be loaded with swordfish, tunas, sharks and other unique fishes which inhabit the upper levels of the open ocean. There was also a second pair of possibilities. Would the gear come in as smoothly as it was set out or would the action of wind, current, and hooked fishes require that we untangle by hand a birds-nest of 4 miles of main line, 500 suspended lines and snarled live or dead fishes up to 8 feet in length? We experienced all of these situations in varying degrees and combinations. Over the whole of the cruise the longlines caught 157 fishes of 13 species including twenty-two swordfish; blue, sickle, dusky, mako, tiger, white tip, and bignose sharks; greater and scalloped hammerhead sharks; sailfish, escolar, and dolphin. Some of the hooked but living sharks were tagged while they were still in the sea and then cut loose. Their capture at some later date will contribute to the study of the movements of large pelagic fishes.

When the longline was being retrieved we often had a school of the fish called dolphin swimming with us. They were apparently attracted by the bait knocked off as the hooks were taken abroad. These fish competed for the bait to such an extent that many took the incoming, baited hooks to become a vicarious part of the catch. Needless to say some of these most flavourful fishes found their way onto the ship's menu the same day. In that case the skeleton was saved for the ROM study collection.

On March 8, sixteen days out of St. Andrews, we sailed into the quaint old Dutch town of Willemstadt, Curaçao. While the ship replaced supplies of food, water and laundry, Peter and I looked about the town and handed over our duties and records to the pair who replaced us for the homeward leg of the cruise. After the usual frustrations of misinformation concerning flights and the formalities of clearing a foreign country, we flew homeward from Curaçao by an island-hopping route in order to stop over in St. Lucia, West Indies. There I arranged for accomodations from which to carry out a period of shore-based work collecting the shallower water reef and shore fishes. In four hours on the island I was able to accomplish a task which in four months of steady correspondence from Toronto had seemed impossible. I managed to rent a cottage on Marie Creek Bay near the north end of the Island overlooking Pigeon Island, the scene of Admiral Rodney's defeat of the French, the last of many times this beautiful volcanic island changed hands between those two nations.

Three months later, on June 15, diving gear, collecting equipment and preserving and shipping supplies were sent off from the ROM, air express, very carefully documented and routed, so they would arrive in St. Lucia well in advance of my need for them on July 1.

Successive experiences—a 9 a.m. flight which did not leave Toronto until 4 p.m.; no propane with which to cook for five days; the unavailability of the vehicle for which I had arranged;



Margaret Crossman and John Crossman seining the beach at one of the St. Lucia stations.

the cramping of 5 maxi people into a mini car; and gear which did not arrive until seven days after I got there—led me to wonder at the value of having gone at all. My family had accompanied me for the experience and as unpaid diving and seining assistants, so the cooking problem was not simple. We had to make do for five days with a "coal pot," the local pottery version of a barbecue. The seven "idle" days were spent settling in, searching out good reefs within working distance of Marie Creek Bay, pleading for gas and vehicle, and making long distance phone calls in search of equipment.

Eventually everything was solved and the opportunity to renew acquaintance with the colourful reef fishes was a reality. In spite of the delay we managed to make 29 collections on about 20 different sites and soon had 109 species of fishes tentatively identified, as well as many specimens which would require better literature before any decision on identity could be made. One reef collection now sorted contains 55 different species of fishes, so the final total number of species collected should approach 150.

As well as collecting with skin diving equipment and nets I was able to learn a little about the native fishery, and acquired specimens from other areas and from water deeper than I could handle by visiting a nearby beach used as a landing by local fishermen. A typical day began with a 7 a.m. visit to the beach to meet these fishermen as they returned from emptying their fish pots (or traps) to buy specimens of any species I had not as yet seen. I was somewhat embarrassed by the fact that I was competing with about 20 local women for the small number of fishes which came ashore each day. There had been no apparent ill feelings and one day one of them, who spoke excellent English, asked me if I was collecting them for a museum where they would be studied. After several other pointed questions she explained to the others in the local, French-like patois what I was doing and informed me that they understood and didn't mind at all. In fact, from that time on, the spirited and noisy competition of these hospitable people did not begin until I had made and paid for my modest selection.

Most of the rest of the days were spent either collecting or observing the fishes on the various reefs.

Among the many differences between the temperate freshwater and tropical marine environments are the adaptations of the vastly greater number of species in the tropics to the pressure of these numbers. The various species express themselves in a bizarre array of shapes and colour patterns. To anyone only partly familiar with the various species there is the added problem that the young and the adults, and the males and females, of a single species may exhibit different colour patterns, further complicated by the possibility of their exhibiting different patterns day and night. This complication of colour patterns haunted me the whole time. In particular there was what we began to call the "mystery fish". We saw this form on almost every reef, but try as we did we were unable to catch one. Since we saw it so regularly it seemed strange that it was absent from the fishermen's catches. This fish was

strikingly counter-shaded—black above, milk white below, with a few, obvious black spots in the white area. None of the books on the fishes of that area that I had with me described or figured such a fish. I had never seen one like it in other Caribbean habitats such as the reefs of Tobago and Barbados. That this enigma should continually escape us approached an obsession.

On the last day that we could add specimens before packing them for shipment home, my wife Margaret suggested we make one last attempt to catch that species only. Luckily we found one very quickly and in a better situation than at any time previously. It was near the bottom in about 12 feet of water and had entered a tunnel-like grotto which had only two openings. I indicated to Margaret that she was to watch one exit and I dove down, squirted an anaesthetic into both entrances, and rose to the surface to watch with a pounding heart. The fish darted out of the grotto and swam to another crevice near by. Both of us noted that at that time the countershading was much less pronounced. We dove again and finally netted a fish from the second crevice, but this fish was an over-all copper-brown with many small, bright blue spots. It was immediately apparent that this was a coney, a species we already knew, and one abundant in the fishermen's catches not only in this colour phase but also in a much brighter *red* with blue spots. You can imagine our disappointment. I dove down again to see if by chance the mystery fish was still in the crevice or had escaped by another opening. There was no other fish, nor any other way out. This *was* our "mystery fish" and we already had several specimens of it in the colour patterns which it must exhibit at other times and which obviously replace the more striking black and white pattern after death or in certain physiological states.

When I got back to the ROM I was able to learn from the literature that other workers had seen this pattern but considered it a transitory one and not typical. In contrast, we had apparently seen no living individuals in the so-called typical pattern. In spite of all of our earlier frustrations we were able to end an enjoyable and profitable experience on a rather egotistical note of triumph and satisfaction. It was also the conclusion of the assembly of another valuable collection of Caribbean reef and shore fishes which should help to advance our studies in that area.

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